

ABSTRACT OF THE DISCLOSURE

A method of producing a semi-solid material without stirring, including heating a metal alloy to form a metallic melt, transferring a select amount of the melt into a vessel, nucleating the melt by regulating the transferring of the melt into the vessel, and crystallizing the melt within the vessel by cooling the melt at a controlled rate to produce a semi-solid material having a microstructure comprising rounded solid particles dispersed in a liquid metal matrix. In one form of the invention, a temperature-controlled shot sleeve is provided for receiving and cooling an amount of metallic melt at a controlled rate to produce the semi-solid material. The shot sleeve has a number of heat transfer zones adapted to independently control the temperature of the melt disposed adjacent various portions of the shot sleeve. The shot sleeve also includes a ram operable to discharge the semi-solid material directly into a die mold to form a near-net-shape part.